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The training of teachers - effective factor in the educational process

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Abstract

During the period 2003-2008 a Rural Education Project was financed in Romania by the World Bank and the Romanian Government. The project focused on the primary and secondary education (compulsory education) teachers in rural areas. Teachers became aware of some methods based on student-centered interactive teaching and continuous evaluation. By applying new methods of classroom teaching and assessment there was a growing interest in physics of the students which led immediately to the improvement of their educational achievements. In schools with AeL (advanced e-learning) laboratories, the teaching activity was much better. AeL physics lessons constitute a new learning approach.

Keywords: compulsory education, interactive teaching, new way to learn;

1. Introduction

During the period 2003-2008 a Rural Education Project was financed in Romania by the World Bank, the Romanian Government and the rural communities. The aim of this project was the professional development of the primary and secondary (compulsory education) school teachers in rural areas. Why rural? The answer is simple: because the teachers in the rural areas are deprived of resources compared with those that teach in urban areas; they have fewer opportunities for academic travel; books, magazines and scientific publications are harder to obtain; the internet is missing in many places, as well as scientific laboratories (and not only), equipped with educational materials are not enough or nonexistent, the textbook is the only teaching tool. Finally, school exchanges are much rarer, in most rural schools, there is only one teacher in one discipline (physics, chemistry, biology, etc.) or one for several disciplines often for different curricular areas. Each county has coordinated the training activities with the help of two or three specialized teachers, called mentors, who formed rural teachers and professors to acquire and apply in the teaching process, new methods, modern teaching techniques and assessment of students.

The activities during the training sessions, both theoretical and applicative, dealt with teaching and evaluation techniques that can be applied in teaching all subjects in compulsory education, but the number of methods with better results in teaching a discipline differs from case to case, the teacher being the one who decides.

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2. Methodology of Research

One of the issues that were addressed right from the first session was that of teaching. In 90% of cases, the teachers, who completed college internships in teaching practice under the guidance of a mentor / tutor for teaching practice or whose activity was coordinated by a mentor or internship methodist in the first two years in the school apply (according to polls) in the teaching process the teaching techniques and assessment, methods they learned and practiced in the above mentioned periods, through their own professional development in training courses organized locally, by the county and nationally or through the individual study in the methodology of the subject they teach. The teachers who have completed formal faculty internship teaching practice apply primarily teaching techniques and assessment tools inspired (or copied) from that of a popular teacher in school, usually in the subject they teach themselves. Before the training sessions, with the target group of rural teachers, both in the first and in the second case the problem of teaching methods and assessment techniques used by them had not been taken into account, considering that the teaching and assessment approaches had been appropriate. When asked how they realized this, the responses were: according to the students' exams/tests results at the end of the cycles - primary or secondary, in school competitions, assessments of local communities and management factors (school principals, school inspectors , primary), etc. In a number of issues, some teachers did not even think about it. For example, many of them graduated long ago, even decades ago, and after 1990, specialized training courses partially covered the training needs.

Meanwhile, the human society has evolved, its requirements too, and some subjects after 1990 have even disappeared from the school curricula, others have reduced their share in it, others have appeared, there have been rapid changes in methodologies for conducting the national exams, more modern technology has increasingly been introduced more in education. Our opening to Europe allowed Romania the access to concepts, techniques, methods and tools that differ from the traditional ones, widely used in Romanian schools. And the expectations of students, parents, society in general have changed. What was good up to a point, has stopped being necessary, what was interesting has passed to another plane of interests, priorities have changed in the list of students' interests and not only.

School has ceased to be only a supplier of information, often unnecessary, it has become a service provider for the students. The student has become placed a priority in the hierarchy of school interests. It has been absolutely necessary to transform the institution itself and teachers to cope with the new challenges of a dynamic society, where the educational purpose of the act (key skills) has become the most important factor. Many teachers have not thought that students can get good and very good learning results using other techniques than those traditionally used excessively, namely attractive techniques for students, modern teaching-evaluation instruments used in an educational endeavor to attract the student to study, to school. Also, after Romania's joining the EU, the teaching approach is in terms of teaching skills development, skills and competences many teachers have not thought that may remain without the “work object” if they do not change the “views”. The purpose of the program was as the teachers, regardless of the discipline/subject taught to become aware of other techniques than those (traditional) which were used almost exclusively in teaching different subjects/disciplines. And physics is one of them. Most young teachers were favored. They took advantage to adjust the fastest and were most receptive to the new and they attended the training sessions with the best results.

Before the practical application of the new teaching-evaluation methods, the expository activities recorded the highest weight assigned in the lesson’s times. In over 40% of the observed lessons the teacher's discourse lasted 15 or even 30 minutes in the economy of a lesson, demonstrating a traditionalist approach of the role of teacher as the sole owner of knowledge and the central element of the teaching and learning processes. Almost exclusively, the students were traditionally set in a classroom, with desks arranged one behind the other, a format that significantly limits the visual and social interaction between students. The investigation revealed that during a lesson, most teachers do not initiate the reorganization of the classroom furniture, keeping the arrangement of the students the same throughout the lessons. In some cases, the feedback for students in the learning process was non-existent, the work of the teacher focusing almost exclusively on teaching rather than learning. The share of these cases ranged from about 4% of all observed classes. In the initial stage of monitoring and evaluation, according to the first

longitudinal study of the project, in almost 70% of the lessons observed there were not conducted any group activities, the frontal type interactions taking up the most important time budget of the lessons. The organization of differentiated activities did not constitute a central element of design and management of the learning activities. There were many situations in which individual activities were organized, but the workloads were not differentiated according to certain characteristics of the students (Rural Education Project, 2005, 2007).

For example, one class of physics in the eighth grade, a teacher took a student to the blackboard to solve a problem on electricity. Once the student reached the final expression, (the numerator and denominator), he replaced numerical values and effectively solved the arithmetic calculation, working out a number with two decimals in 12 minutes (the rest of the class followed almost mechanically the working out, copying what was written on the blackboard). Finally, while discussing the lesson, the teacher was asked why she lost such precious time with simple arithmetic calculations? The teacher's response was: for students, to practice doing mathematical calculations necessary in view of the capacity examination which was due in three weeks' time. Is this not for the math teacher to do? And what was I supposed to do? Such questions seem anachronistic, but for the young and inexperienced teacher, were of great importance. A simple answer to the question for the teacher, was: use the personal computer for calculating the final result (after replacing the numerical values of physical quantities) and the remaining time would have been used for physical interpretation of the results, for class discussion on the physical phenomena that the problem addressed, value judgments, extrapolation, contact with reality or solving other problems.

Modalities and assessment tools, reported by observation, were reduced to a limited number, some recording very low frequencies in all observed classes.

The most common method of assessment (its share being 16,2%, fig.1 -A) was evaluating students during or at the end of the course, followed in importance by oral assessment of the student's knowledge (15,6%, fig. 1 - B). The pair or peer assessment techniques were rarely reported. Also, only in a very small number of lessons (about1%, fig. 1- C) were recorded instances where the teacher communicated to the students the assessment criteria and the performance levels expected (Rural Education Project, 2005, 2007).

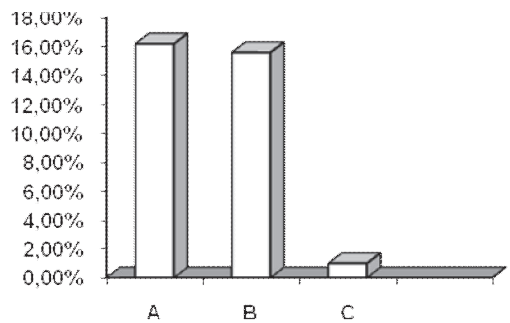

Figure 1 Assessment methods

These findings are valid for all he courses of study in secondary school and hence physics.

The learner-centered interactive teaching has presented and demonstrated the effectiveness of teaching methods applicable to all academic subjects, and the continuous assessment of students has approached, in addition to traditional methods, some complementary methods that lead together to school success:

1. Interactive teaching methods, student-centered: lecture - modern perspective, Brainstorm, I know / I know / have learned, Journal of dual entry, Essay for five minutes, Gallery tour, Cube, Snow ball, Mosaic (The Jigsaw Method), Discussion, Graphic organizer, Problem-based learning, Project (Sarivan, et. al., 2005).
2. Continuous evaluation of students:

I. Traditional methods: oral evidence, written tests, practical tests.

II. Complementary methods of evaluation: the systematic observation of activity and behavior of students, inquiry, project, portfolio, self evaluation (Ţepelea et. al., 2005).

After presenting and practicing new teaching and assessment methods, there were recorded for and against opinions and attitudes of teachers. Emphasis was placed on active and interactive teaching, and the assessment was associated to teaching and the other way around. Some of the physics teachers, apprehensive about the new teaching and assessment methods, justified that approaching them they might not have the physical time necessary to complete the lessons, they will not have time to solve problems, that the noise will increase, the efficiency would decrease and the results would be worse and last but not least, the physical preparation of the lessons, using the new approach, would require a much greater effort from the teacher and the use of auxiliary materials which take time and money to make. In addition, the knowledge of students is very important for school success to be able to select the most effective and appropriate teaching methods. They met cases in which the same methods applied in teaching the same subjects, resulted in different outcomes from class to class, depending on the level of education and understanding of the students and not least on their interest in the study of physics. Opinions "for" and "against" of the teachers were also recorded for the student assessment techniques, in the light of new methods. Having discussed in training sessions, with the teachers, the advantages and disadvantages of assessment methods and tools, i.e. the items, especially those with dual or multiple answer, the portfolio, the project, the essays (mostly downloaded from the Internet), the experiments (especially where you cannot perform in a laboratory or the lack of teaching materials), the assessment of a team where only one is working, while others often look passive, that these methods require a differentiation in a wide range of categories in order to be able to evaluate different knowledge levels of students. It was also concluded that for an effective implementation of these methods the teacher should know the class of students better, and for every type of intelligence appropriate methods of teaching and assessment should be applied.

For physics teachers, it is difficult to know relatively well all students in a short time during only two or three classes per week dedicated to the physics program (three classes for high school students, theoretical pathway - mathematics and natural sciences). Not be neglected that poor motivation to study physics; particularly, for students in final grades (class VIII respectively class XII) leads to less efficient methods, whatever they may be.

However, only within two years, things have improved, such as:

There has been a slight increase in the average time allocated to group activities, from 3.47 minutes in 2005 to 6.6 minutes in 2007. Also it has been observed an increase in the number of the classes in which group activities were organized. The share has almost doubled. The increasing share of lessons with learning activities in small group suggests an improvement in the ability of teachers investigated to use methods and techniques of group work, most likely as a result of the training or mentoring programs. Compared to 2005, in 2007 there has been an 6,5% (fig. 2 – A) increase of the classes not engaged in an expository approach while allocating more than 30 minutes to the teacher's expository discourse decreases by nearly 21% (fig. 2 –B). So the teacher's role as organizer of the student-centered learning tends to replace that of the sole owner of knowledge and core processes of teaching and learning. In 2007, in over 76,1% of lessons observed, the expository methods did not occupy more than 15 minutes thus providing more space for other activities. If in 2005: 44% of the students felt that many teachers focus was on exact reproduction of the information previously taught, the share of students who expressed the view that the approach changed in 2007 decreased to 5,1% (fig.2 – C). Front type interactions were ranked most important in the classroom, reaching on average 21 minutes of the budget for the current time. But in 2007, the share of lessons that allocates 15 minutes for direct interaction teacher - students grew by almost 9% (fig. 2 – D). The 77% of the lessons observed provided sufficient time to achieve a direct feedback from the teacher, with regulating effect on student learning (Rural Education Project, 2005, 2007).

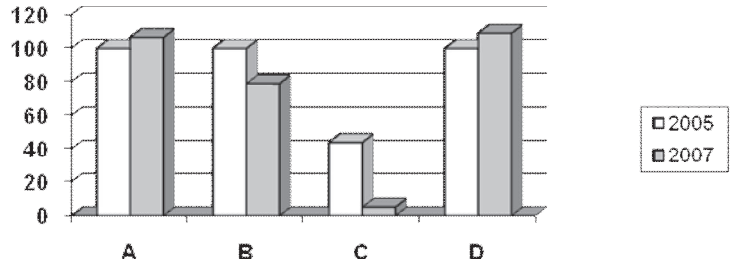

Figure 2 Interaction teacher – students

The teaching materials used most frequently were the traditional materials (handbooks, collections of problems), almost 60% of the lessons observed using this means of learning. Only in 2,3% of cases video or audio materials were used. The share of teaching materials used in class presented the following situation (Rural Education Project, 2005, 2007):

- School Handbook: 42,6% (fig.3 – A)
- Worksheets: 40,2% (fig.3 – B)
- Reports: 10,7% (fig.3 – C)
- Flipchart, whiteboard, magnetic board: 2,9% (fig.3 – D)
- Laboratory Equipment: 4,5% (fig.3 – E)
- Video or audio recordings : 2,5% (fig.3 – F)

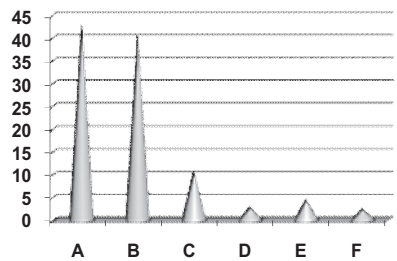

Figure 3 The teaching materials used most frequently

3. Using computer in teaching

In most cases, in the year 2005, the computer was used only by the teacher to demonstrate some aspects of the lesson content. The number of cases where modern means of education were used in the classroom increased significantly in 2007, although, in total, their share did not exceed 4,3% of the lessons observed. Compared with 2005, in 2007 there increased the share of group activities, nearly two in three of the classes observed, which means twice as many. This suggests the improvement of the investigated teachers' ability to use methods and techniques of group work, most likely as a result of training and mentoring. However, the time variation given to group activities in a lesson shows that these methods are not a constant teaching approach in all schools in the sample, but rather a strategy adopted by a small number of teachers. It was observed an improvement in the mobility and interaction potential of students. There was also a significant decrease in lessons where students were seated in the traditional classroom (from 91% to 77%, fig.4 - A). Internet access was provided to students in 2007 only in 42% of secondary schools, compared with 10% in 2005 (fig.4 – B). Unlike the two classes in which the computer was used as a means

of education, in 2005, in 2007 their number reached 22 (fig.4 – C). And of the 511 lessons observed, in 19 lessons teachers used other media means (Rural Education Project, 2005, 2007).

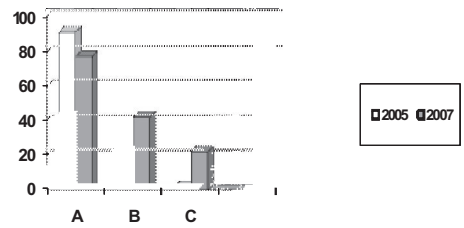

Figure 4. The mobility of students and the computer used as a mean of education

4. Conclusions

Observations of physics lessons with a view to applying modern teaching methods – assessment, shows no doubt, that students interest in physics classes and school in general has increased significantly. Students participate more actively in class, doing practical work with the teacher.

The methods most frequently used in physics activities are (Miron, 2009; Malinovschi, 2003):

- ✓ explanation
- ✓ heuristic conversation method, types of conversations: communication, reinforcement and systematization, follow up activities, introductory, final
- ✓ method of instruction by problematization. On the basis of this method there are concept situation – problem and problem. As types of problems, especially as homework, are theoretical research issues, design issues or methods of measuring physical experiments, problems of rationality, problems of finding natural ways to solve practical problems.
- ✓ discovery: searching and finding a solution to the proposed problem
- ✓ systematic observation and independent method
- ✓ experimental method: research experiment, discovery, experiment demonstration
- ✓ demonstration method: demonstration of observational, experimental demonstration, the analogue demonstration, scheduled demonstration
- ✓ method of modeling: modeling by similarity; models: material, similar, parts, modeling by analogy: the figurative, symbolic, propositional models.

Computer use in training for physics is increasingly used more as a tool, or as part of the instructional process (Sarivan et. al., 2005 , Ţepelea et. al., 2005):

a). School activities that can be made using the computer as a tool:

- ➢ development or review of any kind of written document, using a text editor
- ➢ graphical presentation of information in any form or issuing of drawings
- ➢ performing numerical calculations for training computer skills, data processing, etc.
- ➢ making and using databases
- ➢ learning a programming language
- ➢ computer-assisted physics laboratory

b). As a means of intervention in the instructive:

- ➢ directly - computer makes the task of teaching
- ➢ indirectly - the computer acts as manager of training.

In schools where there are AeL (advanced e-learning) laboratories things are much better. The AeL physics lessons are a new way to learn, in addition to those usually applied. The AeL system contains packages that allow multiple independent activities during a lesson, which can be used by the teacher according to the teaching strategy adopted, type of lesson to be made, but also according to the students, working in groups or individually, normally

or in a differentiated manner. Physics teachers are able to conduct virtual experiments, to visualize the physical phenomena under study and administer multiple choice tests in a short time. The answers are often found immediately by the students, and they can easily perform self-assessment.

Certainly, we cannot talk about a universal prescription, in terms of increasing physics attractiveness, but in addition to the use of modern and updated teaching aids and tools, an important role is training teachers by involving them in finding solutions and methods to solve new situations.

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